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ABSTRACT

NASA will launch Space Station Freedom piece by piece in the cargo bay of space shuttles. The process is scheduled to start in 1995 and be completed in 1999. This pamphlet presents factual information and accompanying hands-on science activities concerning the following aspects of the project: (1) the space shuttle's role in transport; (2) the control center; (3) rendezvous, in a weightless condition, with the space station for bringing in supplies; (4) the design of the space station and its use of solar energy; (5) living areas in the space station and the use of hatches and air locks; (6) performing tasks outside of the space station with manipulators in the cuppola, and through space walks; (7) eating and food dehydration; (8) washing needs, water usage, and water conservation; (9) health care and exercise; and (10) sleeping in space. Each activity has an accompanying list of vocabulary words and there is a list of definitions on the last page of the booklet. There are large illustrations for each activity. A listing of regional NASA Teacher Resource Centers is reproduced on the back cover. (PR)

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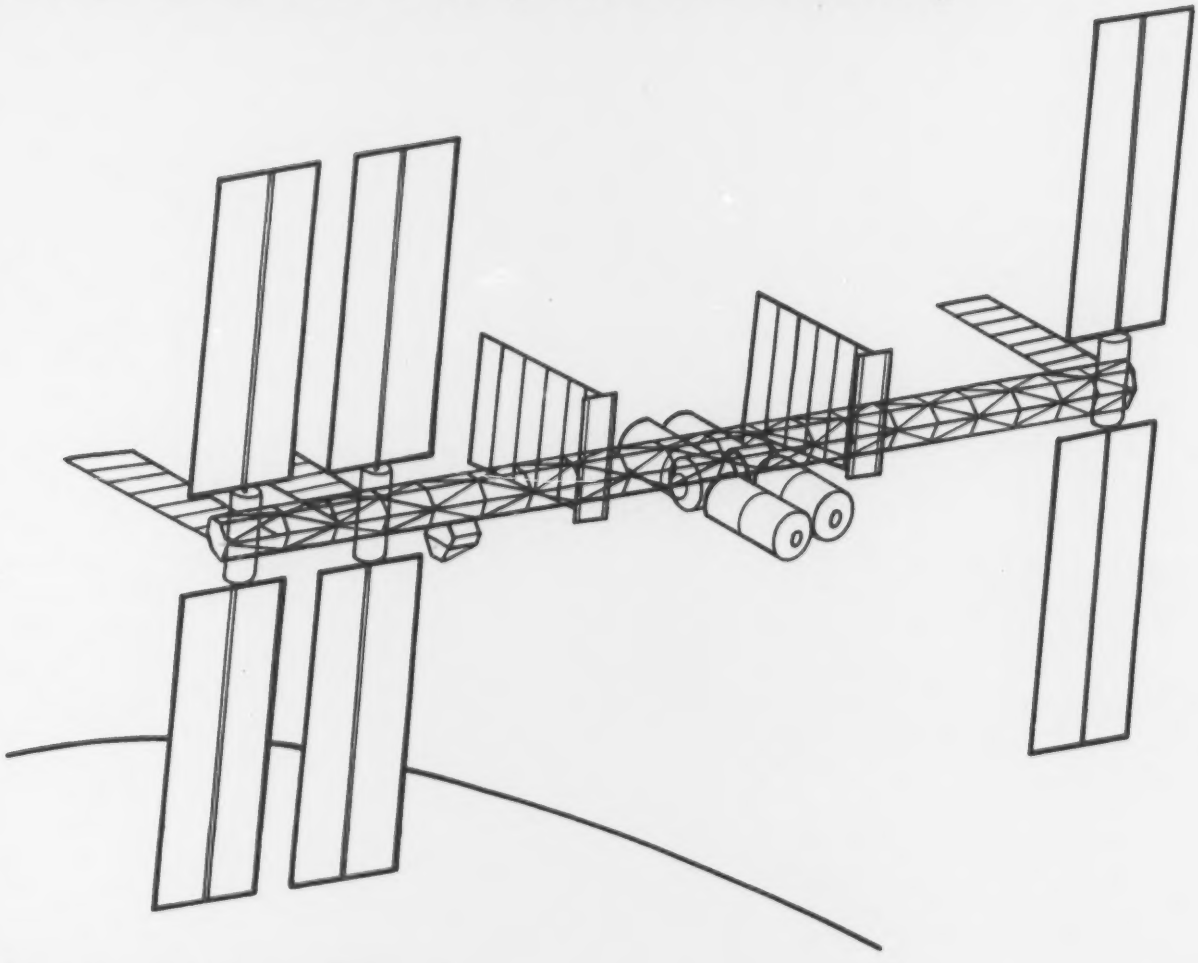
FREEDOM

Space Station *Freedom*

The Dream Becomes Reality



A Learning Tool

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National Aeronautics and Space Administration

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Welcome to Space Station *Freedom*

This booklet was prepared by the National Aeronautics and Space Administration (NASA) for use by teachers in the classroom or by parents at home.

The explanations, vocabulary lists, classroom activities, illustrations, and definitions are meant to be used to educate elementary-level school children. This page briefly describes the format used in the booklet.

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Vocabulary List

Highlights words used in the explanations that may be used as vocabulary or spelling lessons.

A list of definitions may be found on the last page of this booklet.

Classroom Activity: Subject Matter

Briefly describes the classroom activity.

Materials and Tools: Lists items needed to conduct the classroom activity.

Procedures: Describes how to conduct the classroom activity step-by-step.

Additional Activity: Gives ideas of additional activities that can be conducted or how to use the illustrations for an educational activity.

Illustrations on facing pages ⟶

Space Shuttle Lift-off!

The National Aeronautics and Space Administration (NASA) will launch Space Station *Freedom* part by part in the large cargo bay of the Space Shuttle. It will take about 17 Shuttle flights over a period of four years to build *Freedom* in orbit over Earth.

In late 1995, the Shuttle will carry four important parts of *Freedom* into orbit. Just as toy building blocks need bottom blocks to hold them together, the first four parts will provide the foundation on which the rest of *Freedom* will be built. Additional parts will be taken up throughout 1996.

In late 1996, *Freedom* will be ready for people to come aboard for short periods of time. The first astronauts will visit for at least 13 days at a time.

In late 1999, the building process will be complete. Four or five times a year after that, the Shuttle will return to *Freedom* to bring up crew replacements, new experiments, new supplies and spare parts, and will return people, equipment, and finished products to Earth.

How old will you be in 1999, when *Freedom* is completed?

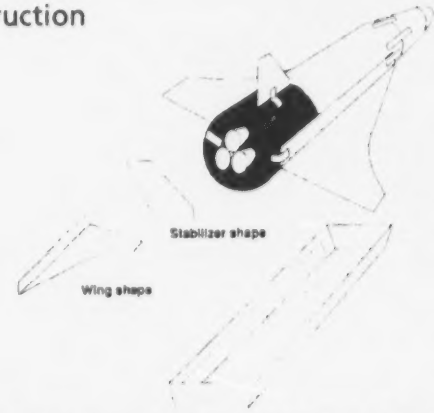
Vocabulary List

- Astronaut
- Cargo Bay
- Experiment
- Foundation
- Launch
- NASA
- Orbit
- Replacement
- Space Shuttle
- Space Station *Freedom*
- Spare

Classroom Activity: Space Shuttle Model Construction

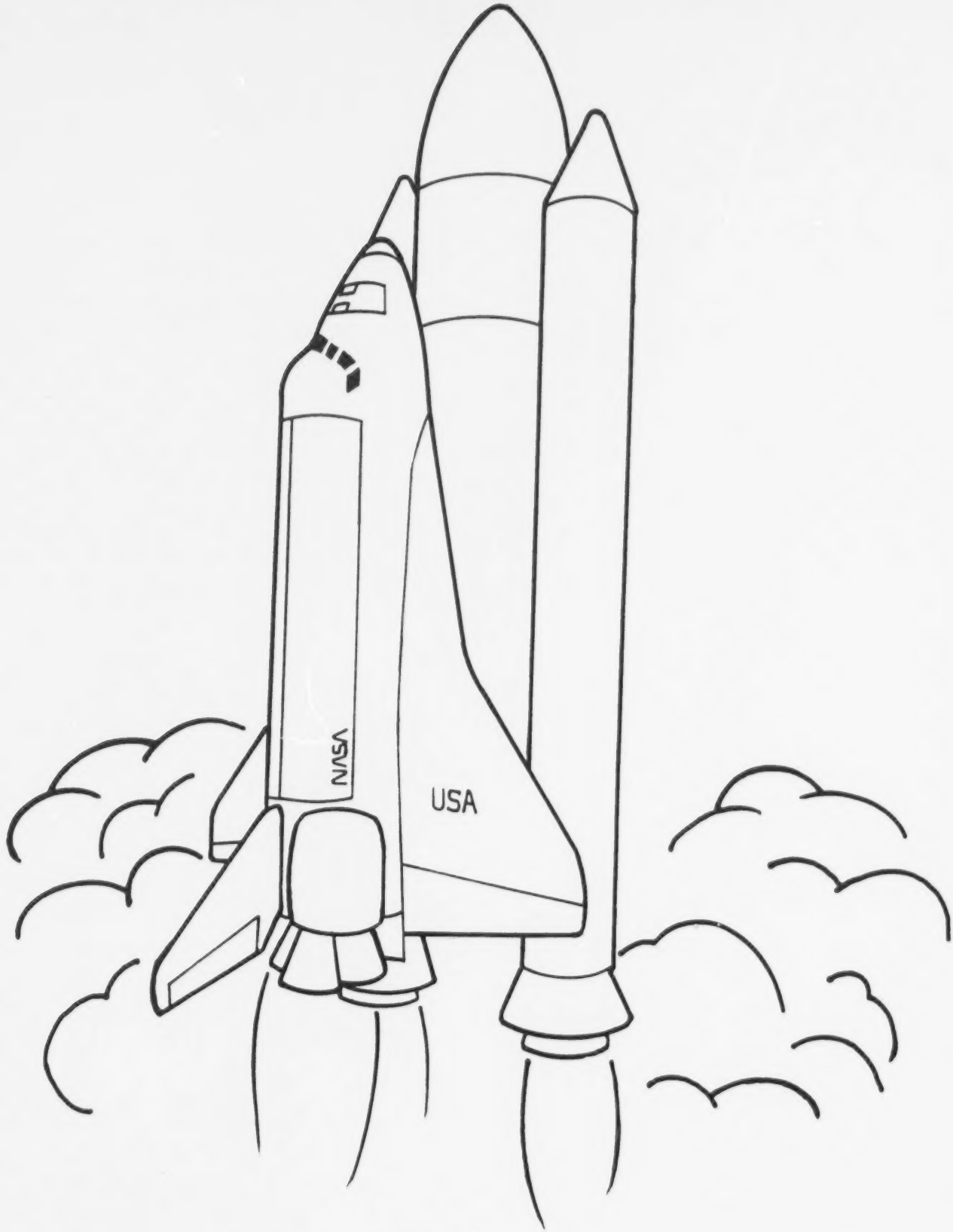
Materials and Tools:

2-liter plastic soda pop bottle
2 egg cartons
6-oz paper cup
Masking tape
Newspaper
Glue for papier-mâché
White glue
Scissors



Procedures:

1. Cut two wings from the top of an egg carton as shown in the diagrams. Tape the wings, as shown, to the bottle.
2. Cut out an "egg well" from the carton and tape to the bottom of the cup to round off the flat surface. Tape the cup over the neck of the bottle. If the neck is too long to permit a good fit, take a sharp knife and trim it off a bit.
3. Cut out a vertical tail for the model from the egg carton and tape it onto the bottle.
4. Cover the model with papier-mâché. Narrow strips of newspaper are easiest to work with. Let the papier-mâché dry and add additional layers for strength.
5. Cut three egg wells to make engines for the orbiter. Cover each well with papier-mâché and let it dry.
6. When the body of the orbiter and the engines are dry, glue the engines to the tail end of the model as shown.
7. Paint the model and add decals, stars, and other decorations when dry.


NASA
USA

Space Station Control Center

NASA will need many people on Earth to monitor the systems and the crew on Space Station *Freedom*. Most of this will be done from the Space Station Control Center on Earth using satellite communications. Other scientists and engineers at different locations around the world also will be able to receive and send messages to and from *Freedom*.

The Control Center will have many computers operated by flight controllers who will be in continual contact, day and night, with the astronauts. The flight controllers and astronauts also will use earphones and microphones to communicate with each other. They will be able to help the astronauts solve any problems, answer their questions, or assist them with experiments.

The Control Center will have large screens that will show the location of *Freedom* in relation to Earth at all times.

Vocabulary List

Computer

Control Center

Earphone

Flight controller

Microphone

Monitor

Satellite communications

Space Station Control Center

Classroom Activity: Communications

This experiment demonstrates that sound travels through different materials. In this experiment, sound travels through a string. It simulates the use of a microphone and earphones.

Materials and Tools:

Sharp Pencil
2 styrofoam cups
Thin string (enough to stretch across a room)

Procedures:

1. Use a sharp pencil and punch a **very small** hole in the center of the bottom of each cup.
2. Put the ends of the string through the hole in each cup and tie **large** knots.
3. With a friend, stretch the string tight. Take turns talking into the cups.

   How does the sound get to you?
   What part of the telephone is the microphone? the earphone?
   How is your cup telephone like the astronauts' headsets?

Additional Activity: Identify the continents and oceans on the Control Center screen in the illustration. Use a globe to show the path of Space Station *Freedom* over the continents.

Freedom

Rendezvous

Here comes the Space Shuttle on a resupply mission to Space Station *Freedom*. Every 90 days the Space Shuttle will transport a new crew, supplies, and new experiments to *Freedom*. It will return to Earth with the previous crew members, wastes, experiment results, and new products made in space.

Most of the crew will return to Earth every three months. Some will stay on *Freedom* for six months and some may stay longer, maybe as long as one full year. Long stays will allow us to study the effects of low gravity or "weightlessness" on people.

Right now, we do not know enough about staying in space for a long time. Astronauts get sick and weak from being weightless. We need to find a way to keep them healthy and fit before we can send a crew to Mars. It may take two or more years to get to Mars and back. We also want to build an outpost and factories on the Moon. Before we do those things, we need to learn a lot on Space Station *Freedom*.

Vocabulary List

Crew

Gravity

Factory

Mars

Mission

Moon

Outpost

Rendezvous

Resupply

Transport

Waste

Weightlessness

Classroom Activity: Weightlessness

This experiment simulates a feeling of weightlessness. Have the students understand and use the following words as part of this activity:

- Gravity - a force that pulls bodies toward the center of Earth. This force gives objects their weight.
- Weight - the heaviness an object has because of the pull of gravity. Objects are pulled down or held down.
- Weightless - having little or no weight because the force of gravity has been balanced by the force of forward speed.
- Weightlessness - the feeling of floating because of the lack of gravity.

Procedures:

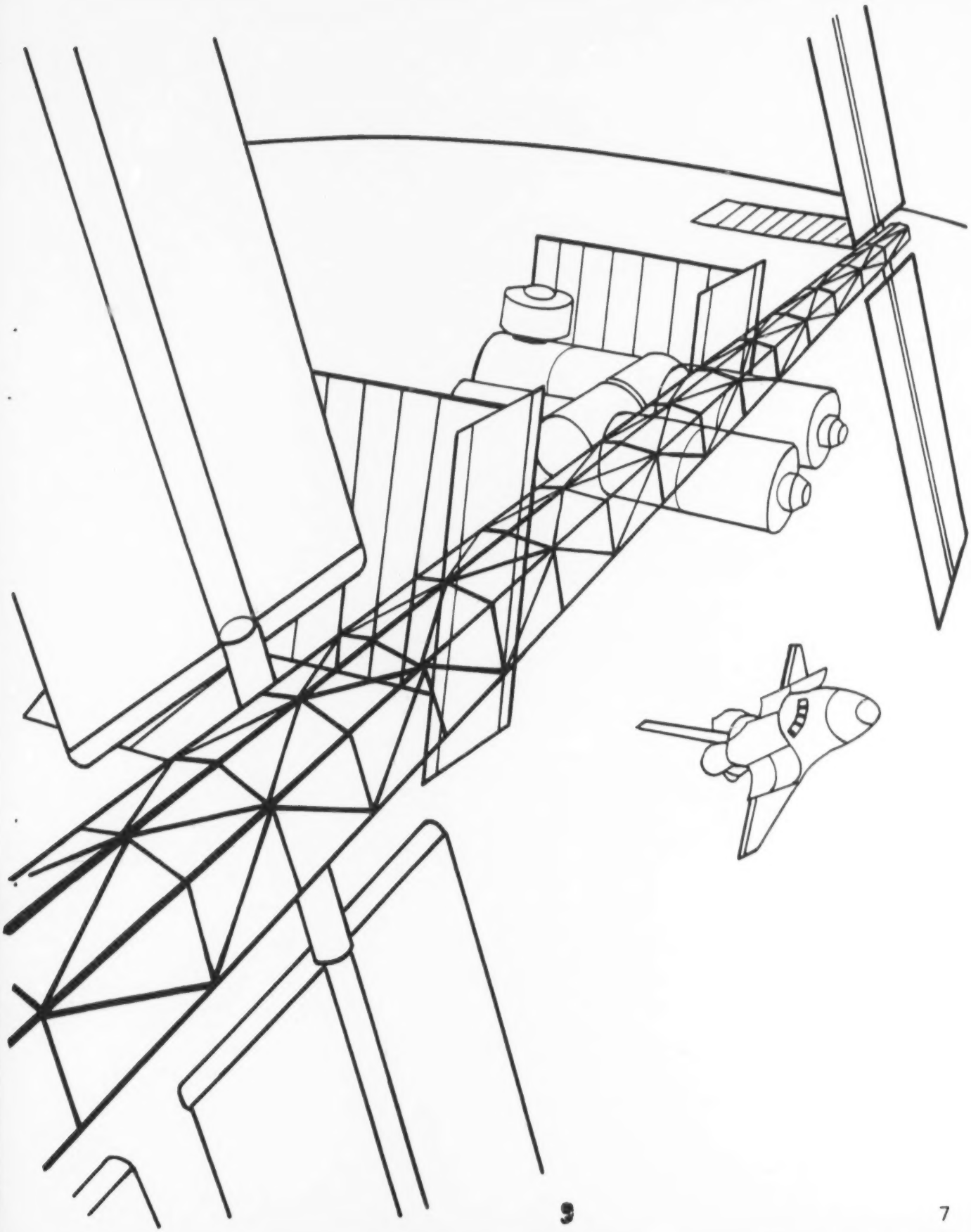
1. Stand with your side to the wall and your shoulder and arm pressing hard against the wall. Make a fist. Keep your arms straight, and press your fist hard against the wall.

2. Count slowly for ten seconds (1 and 2 and 3, etc.).

3. Take one sidestep away from the wall. Relax completely.

   What happens to your arm?
   The same thing would happen when your whole body is weightless in space.

Additional Activity: Identify, outline, and label geometric shapes that can be found in the illustration.



A Description of Space Station *Freedom*

Space Station *Freedom* will be about as long as a football field, including the end zones, and will weigh about as much as a jumbo 747 airplane. It will be about as tall as a 24-story building.

At the middle of *Freedom* will be four modules that will be pressurized to simulate Earth's atmosphere. Two of the modules are being built in the United States: The U.S. Laboratory (Lab) Module, where the crew will work and perform experiments; and the Habitation (Hab) Module, or living module, where the crew will eat, sleep, exercise, or relax after work. The two other laboratories will be built by Japan and Europe.

Located on either side of the modules will be radiators to get rid of extra heat generated by equipment and experiments inside *Freedom*. The radiators will also get rid of extra heat generated by the intense heat of the Sun.

The truss, which looks like a large building crane, will be the backbone of *Freedom*. The solar arrays will be at each end of the truss. They will rotate to catch the Sun's rays as *Freedom* circles Earth. *Freedom's* power system will turn sunlight into electricity, like a solar-powered calculator works on Earth.

Vocabulary List

Atmosphere
Calculator
Crane
Habitation Module
Laboratory Module
Module
Pressurized
Radiators
Reflectors
Rotate
Simulate
Solar Array
Solar-powered
Truss

Classroom Activity: Using Solar Energy to Capture Heat

The simplest way to tap the Sun's power is to collect its heat. This experiment shows how sunlight can be captured to heat water. Dark materials will more readily absorb the Sun's energy and transfer it to the water. Covered glass will help to retain the heat.

Materials and Tools:

Clear glass casserole dish with clear glass cover
A piece of dark-colored material, like a black garbage bag or black construction paper
Thermometer

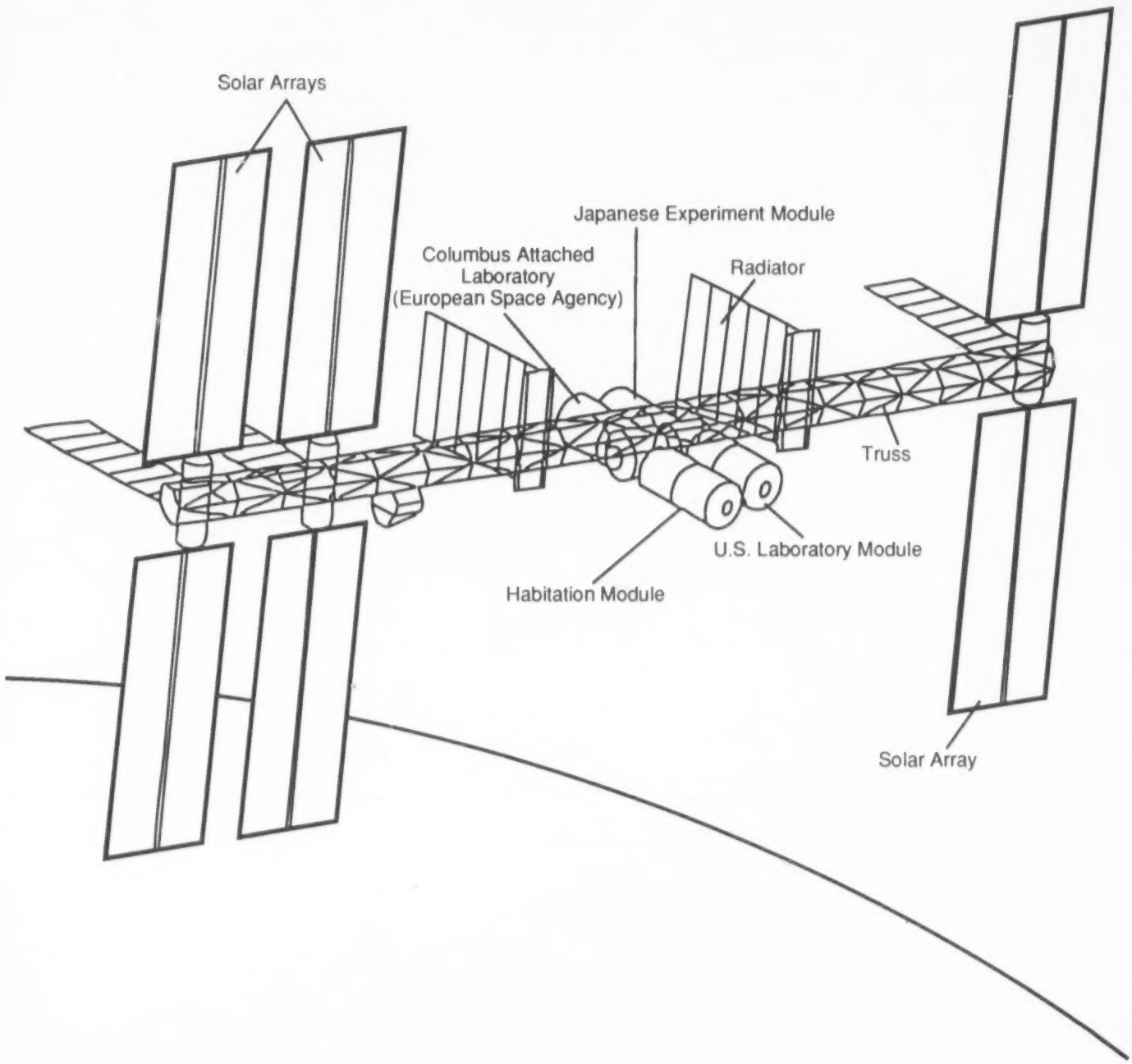
Procedures:

1. Fill the glass casserole dish with 5 centimeters (two inches) of water. Place a thermometer in the bottom of the dish. Record the water temperature. Place the glass cover over the dish.

2. Place a piece of dark-colored material on a window sill in the sunlight and place the casserole dish on top of the black paper.

3. Wait for one hour, remove the thermometer, and record the temperature. What is the difference in temperature?

Additional Activity: Conduct the same experiment using a piece of light-colored material under the casserole dish. Explain that the water will not heat as quickly because lighter-colored materials reflect the Sun's energy.


Solar Arrays
Japanese Experiment Module
Columbus Attached
Laboratory
(European Space Agency)
Radiator
Truss
U.S. Laboratory Module
Habitation Module
Solar Array

Inside Space Station *Freedom*

In the Hab Module, or living module, the crew will eat, sleep, exercise, play games, and watch television. The health center will be located here along with the sleeping quarters, a toilet, and a shower.

In the Lab Modules, the crew will perform experiments and do research.

On Earth we cannot work, play, or move around on ceilings or walls, but inside Space Station *Freedom*, there will be no "up" or "down."

The living module and the laboratories will be connected to smaller modules, called resource nodes, that serve as passageways to other parts of *Freedom*. Equipment needed to operate *Freedom* will be stored in the resource nodes. Other modules, called logistics carriers, will hold supplies.

An airlock will be connected to a resource node. In the airlock, the astronauts will put on space suits and prepare to go outside *Freedom* through an opening called a hatch.

Vocabulary List

Airlock

Exercise

Hab Module

Hatch

Lab Module

Logistics Carrier

Passageway

Research

Resource Node

Space suit

Weightless

Classroom Activity: Hatches and Airlocks

This experiment simulates movement through hatches and airlocks aboard Space Station *Freedom*.

Materials and Tools:

1 large cardboard box (from a new refrigerator or dishwasher)
Exacto knife
Teacher's board compass (or a string and pencil)

Procedures:

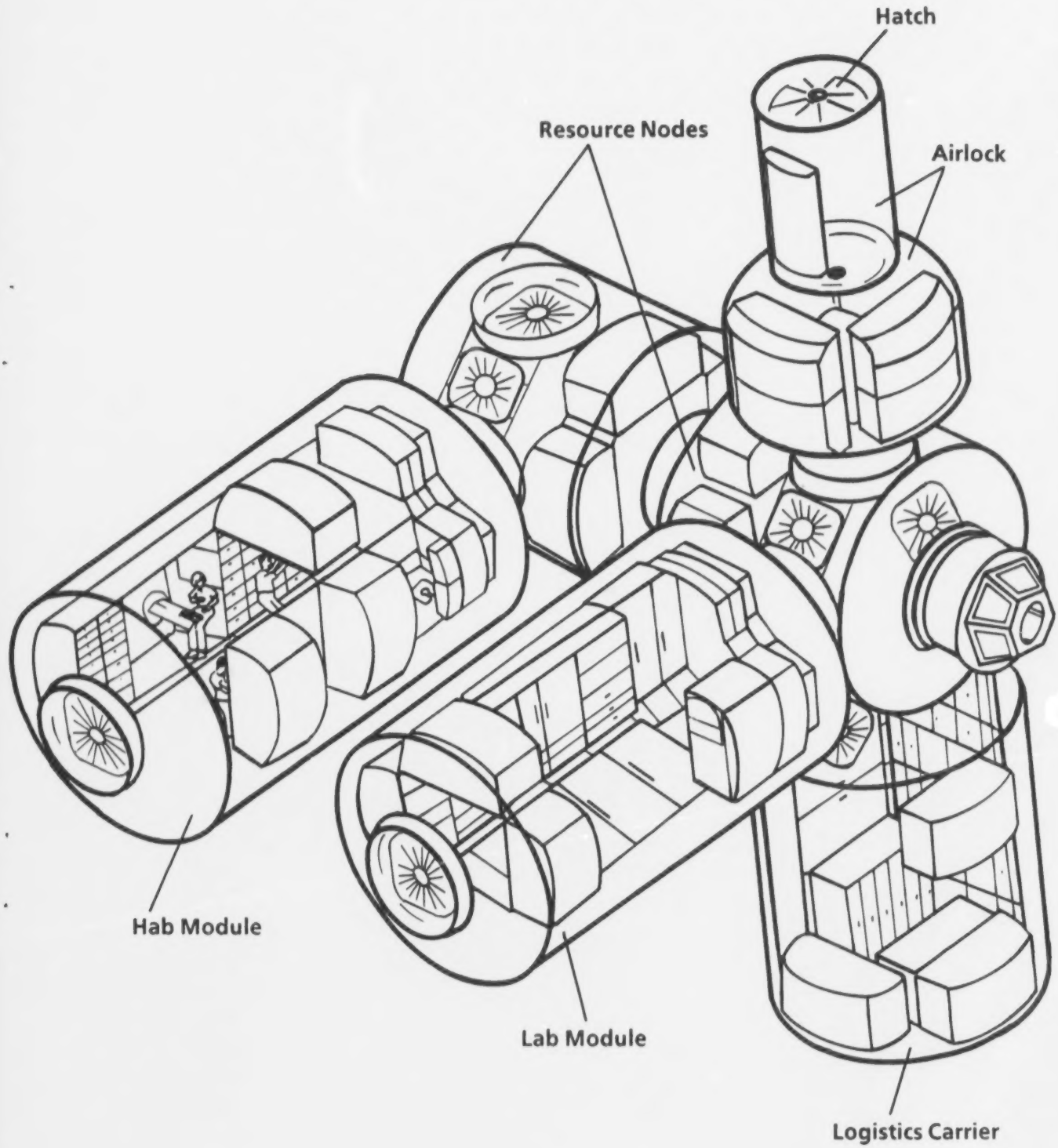
1. Use your teacher's board compass (or a string and pencil) to draw large circles on opposite sides of the cardboard box.

2. Have an adult cut open the circles, leaving one side of each circle attached to the box.

3. Open one hatch (circle). Crawl inside. Close the hatch. Move to the other side of the box. Open the other hatch (circle). Crawl out. Close the hatch.

   How is the cardboard box like an airlock?
   Why does an astronaut use an airlock?

Additional Activity: Using the attached illustration and large marker pens, draw paths through Space Station *Freedom*. Describe what astronauts do in each area.



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Cupola

NASA engineers have designed a window for Space Station *Freedom* called a cupola. This "window on the world" will give a great view of Earth and equipment outside *Freedom*.

Inside the safety and comfort of the cupola, two of *Freedom's* crew members will observe Earth below or the universe above. They will also watch the Space Shuttle approach *Freedom*.

When astronauts are outside on a space walk, which NASA calls extravehicular activity, the crew member inside the cupola will watch out for the astronauts, turn on lights and cameras, and provide assistance. The astronauts outside may be repairing parts of *Freedom* using special tools designed for their bulky space suit gloves.

Special manipulators (like robots) outside *Freedom* will be controlled by crew members from inside the cupola. The manipulators are part of the Mobile Servicing System, built by Canada, which will move along the truss like a train on a track. The crew member inside can look out and control the robots outside the *Freedom*. This is called telerobotics.

Vocabulary List

Cupola

Engineer

Extravehicular activity

Manipulator

Mobile Servicing System

Observe

Robot

Space walk

Telerobotics

Universe

Classroom Activity: Space Gloves and Tools

This activity simulates the gloves worn by astronauts on space walks and illustrates the problem of manipulating objects while wearing bulky gloves.

Materials and Tools:

Several sets of thick insulated ski gloves or heavy rubber work gloves
Needle-nose pliers
Screwdriver
Socket wrenches
Small machine screws and nuts

Procedures:

1. Work with the tools and objects without gloves on.
2. Put on the gloves and begin working with the tools and other objects.
3. Compare the difficulty of doing particular tasks with bulky gloves on.

Additional Activity: Assemble a large model of Space Station *Freedom* using a set of Tinker Toys™ or Legos™. Remove parts of the structure and have the students reassemble the parts while wearing the bulky ski gloves.

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Sitting Down to Dinner

After many hours of working on *Freedom*, the astronauts will want to eat some of the fresh food delivered by the Shuttle. The astronauts will meet in the wardroom, or the dining area, of the living module at dinner time. They will strap themselves to fixed benches in order to stay seated at the table.

Little vacuum holes in the table will keep their plates and cups from sliding or floating away. Their plates and glasses also will be covered. Otherwise, the peas and corn would scatter and the milk would float in large globs all over the place.

The kitchen on *Freedom* will be equipped with microwave and convection ovens. The astronauts will eat frozen, dehydrated, and vacuum-packed foods.

Vocabulary List

Convection oven

Dehydrated

Microwave oven

Vacuum

Vacuum-packed

Wardroom

Classroom Activity: Food Dehydration

This experiment allows hands-on experience with dehydrating a familiar food.

Materials and Tools:

2 apples
Knife
Large-eyed needle
30-centimeter (12-inch) piece of yarn

Procedures:

1. Put one apple in a cool place. Peel and cut the other apple into 6 round slices.
2. Push the threaded needle through each apple slice.
3. Hang the pieces to dry. Check them each day.
4. Place the whole apple next to the pile of dried apple slices. Compare the whole apple with the dried apple slices.

   Which takes up less room? Why?

Additional Activity: Collect pictures illustrating foods. Categorize according to food groups, then use the pictures to create group collages for display.

Personal Care

Just like you, the astronauts aboard Space Station *Freedom* will have to brush their teeth, take showers, and go to the bathroom.

A typical crew member will use about 23 liters (six gallons) of water each day for drinking, dishwashing, laundry, and personal care. That's more than 2,760 liters (680 gallons) a month for a crew of four, about 33,580 liters (8,274 gallons) a year, or 31 metric tons (35 tons) of water. Water will be recycled and used again and again. Even waste water will be recycled and purified for drinking. The oxygen from air will be recycled, too.

Brushing teeth will be easy. Taking a shower or using the bathroom will be a bit more difficult in space. Suction equipment, like many small vacuum cleaners, and air flows will remove water and waste from the astronauts' hair and bodies.

Because the crew members must conserve as much water as possible, long showers will not be allowed on *Freedom*.

Vocabulary List

Conserve

Liter

Metric

Purified

Recycled

Suction

Classroom Activity: Water Usage and Conservation

This experiment shows an approximate comparison of water used by astronauts on Space Station *Freedom* to that used in typical households on Earth.

Materials and Tools: Paper and pencils

Procedures:

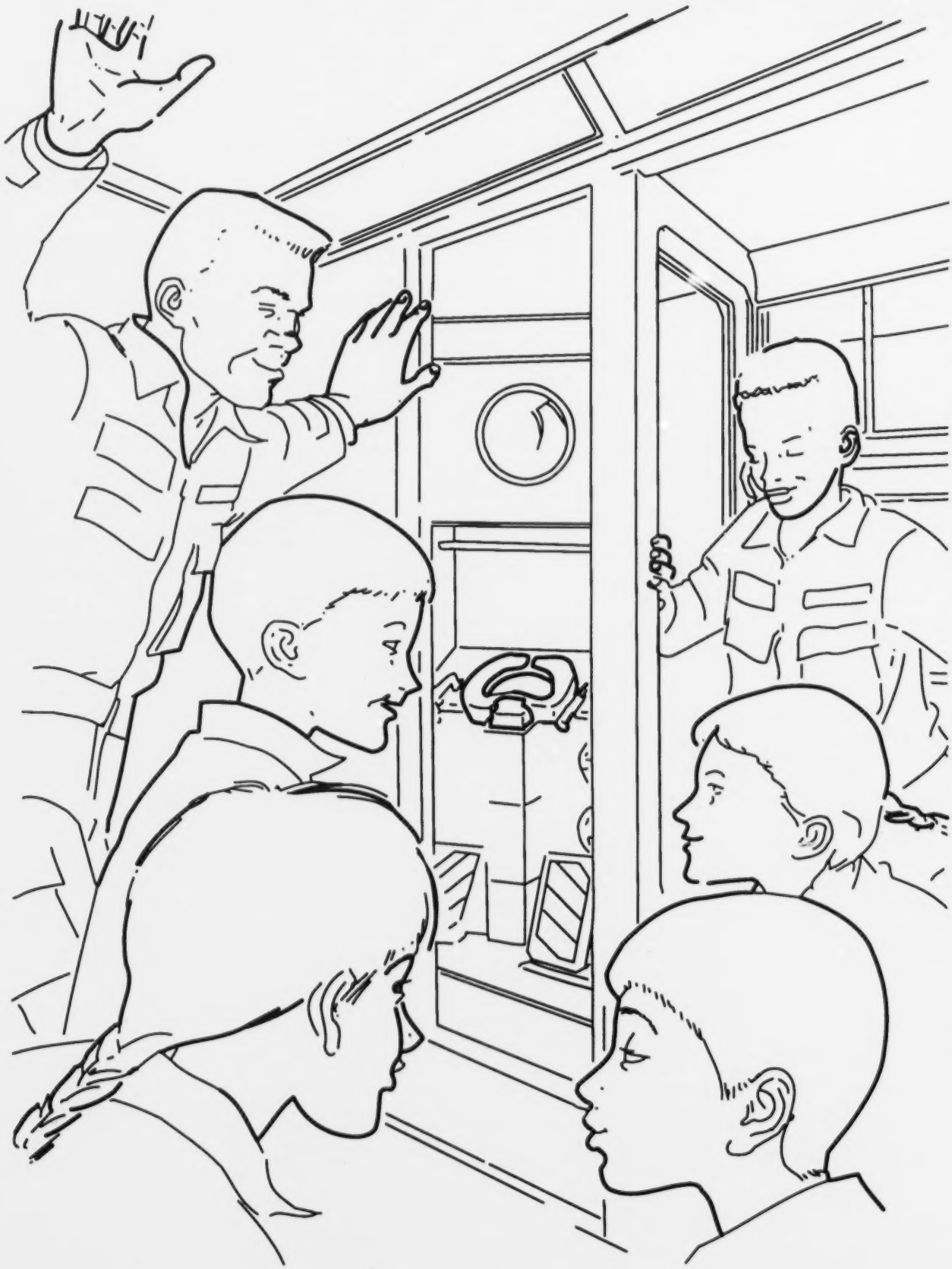
1. Create a large chart that looks like this:

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Totals
Drink of Water	___	___	___	___	___	___	___	___
Dishwashing	___	___	___	___	___	___	___	___
Laundry	___	___	___	___	___	___	___	___
Personal Care								
Brushing Teeth	___	___	___	___	___	___	___	___
Showering	___	___	___	___	___	___	___	___
Flushing Toilet	___	___	___	___	___	___	___	___

2. Mark the number of times each day that water is used in the categories above. At the end of the week, add up the rows and write in the totals.
3. Multiply the totals in each category by the following amounts to determine how much water the students used in each category. Add all the categories together to get a weekly total, multiply that by 4 and 52, and compare that to what the astronauts use.

Drink of Water	.5 liters	(16 ounces)	Brushing Teeth	6 liters	(1.5 gallons)
Dishwashing	53 liters	(14 gallons)	Showering	258 liters	(68 gallons)
Laundry	190 liters	(50 gallons)	Flushing Toilet	15 liters	(4 gallons)

Additional Activity: Discuss ways the astronauts on Space Station *Freedom* and students on Earth could conserve water.



Health Care

The Crew Health Care Facility, located in the living module, will be the "sick bay" on Space Station *Freedom* where the crew will go for treatment when they are sick or injured.

Just like a doctor's office, there will be medicines, monitors, and instruments to treat the astronauts.

If a major accident or illness happens, an astronaut can be treated here and prepared for an emergency return to Earth.

The Facility also has a "gym" where the crew will exercise to keep healthy and fit. This is especially important in a weightless environment where muscles can get weak and bones can get brittle.

Vocabulary List

Accident

Brittle

Emergency

Health Care

Illness

Instrument

Medicine

Treatment

Classroom Activity: Exercise

This is a hands-on experiment using exercises devised by NASA for space travelers. The exercises used are isometric. They strengthen muscles through the use of immovable resistance.

Materials and Tools:

Clock with a second hand

Procedures:

1. Grasp your right hand with your left hand, palms facing. Pull in opposite directions for five sections. Release. Repeat this exercise for ten seconds and again for twenty seconds.

2. Place hands against a wall or stationary object and practice running in place while pushing for five minutes. How is this exercise like running on a treadmill?

Additional Activity: Try each one of the exercises above and take pulse readings. Use the chart below to show how pulses change.

Hand Exercise: Pulse Before _____ Pulse After _____

Wall Exercise: Pulse Before _____ Pulse After _____

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Bedtime Aboard Space Station *Freedom*

The beds on Space Station *Freedom* will be sacks, like sleeping bags. Each astronaut will have a private sleeping bag.

Sleeping in the weightlessness of space is very different from sleeping on Earth. In space, arms float up, heads bob, and the body drifts around if it is not held down. The sleeping bag will hold the astronaut in place.

Astronauts on *Freedom* will work 10 hours a day, 6 days a week.

This astronaut has had a busy day, so it is time to get some sleep.

Vocabulary List

Bob

Drift

Float

Private

Weightlessness

Work

Classroom Activity: Simulating Sleeping in Space

This is a hands-on activity that simulates what it is like to sleep in space.

Materials and Tools:

Sleeping bag

Belt

Procedures:

1. Take off your shoes. Zip yourself inside the sleeping bag. Leave your arms outside. How do you feel now?

2. Have a friend strap the belt around the sleeping bag so your arms are held down. Close your eyes. Wait two minutes. How do you feel now? Could you sleep like this?

   Why do you think astronauts must be strapped down?

Additional Activity: Brainstorm words that describe how students would feel sleeping facing up, facing down, standing up. Discuss why the same sleeping positions would feel different in space. Ask the students to write a story about unusual sleeping arrangements that they have been exposed to -- cots, couches, chairs, hammocks, car seats.

Definitions

Accident: An unexpected happening that causes harm.

Airlock: An airtight chamber located between two areas of unequal pressure.

Astronaut: A person trained to pilot, navigate, or participate in the flight of a spacecraft.

Atmosphere: Gases surrounding planets like Earth and held in place by gravity.

Bob: To nod or move suddenly or jerkingly.

Brittle: Easily broken, cracked, or snapped.

Calculator: A small mechanical device that adds, subtracts, divides, and multiplies.

Computer: An electronic machine that performs high-speed mathematics.

Conserve: Save.

Convection Oven: A method of cooking by the upward movement of hot air.

Crane: A device with a swinging arm, such as a building crane.

Crew: The people operating a spacecraft.

Cupola: A round roof or ceiling.

Dehydrated: To lose water or to take the water out of something.

Drift: To be carried along by air or water.

Earphone: A device that carries sound and is worn or held to the ear.

Emergency: An unexpected happening that needs immediate action.

Engineer: A person who designs, constructs, or operates engines or devices.

Experiment: A test made to show if something works.

Extravehicular Activity: Activity by an astronaut outside a space vehicle.

Factory: A place where goods are made.

Float: To move slowly on top of the water or in the air.

Foundation: The part of a building that is below the ground and on which it rests or is supported.

Gravity: The force which attracts all bodies toward the center of Earth.

Habitation Module: The Space Station *Freedom* module where the living area is located.

Hatch: An opening or a doorway to another area or outside.

Health Care: Treatment when sick or injured.

Illness: In poor health; sickness; disease.

Instrument: A device for recording or measuring.

Laboratory Module: A Space Station *Freedom* module equipped for scientific experimentation, research, or testing.

Launch: To move or set in motion with force; propel.

Liter: A metric unit of volume equal to 1 cubic decimeter or 61.025 cubic inches.

Logistics Carrier: A Space Station *Freedom* module that holds supplies.

Medicine: A drug or other substance used in the treatment of disease, healing or relieving pain.

Metric: A standard of measurement based on the meter and the gram.

Microphone: A device that makes sounds louder than they actually are.

Microwave Oven: An oven that cooks quickly.

Mission: An operation assigned to a particular group of people.

Definitions (Continued)

Mobile Servicing System: A Space Station *Freedom* system capable of moving or being moved.

Module: One of many units used in building a spacecraft.

Monitor: To watch, track, or follow an activity.

NASA: National Aeronautics and Space Administration.

Observe: To watch and to study scientifically.

Orbit: To travel in circles around Earth.

Outpost: An outlying settlement.

Passageway: A passage way from one location to another.

Pressurized: To keep normal air pressure in an area such as a spacecraft or airplane.

Private: Belonging to a particular person or group.

Purify: To clean or make pure.

Radiator: A cooling device that prevents water or equipment from becoming too hot.

Recycle: To use again.

Reflectors: Surfaces that, like a mirror, reflect dangerous radiation.

Rendezvous: Two spacecraft or people meeting in one place.

Replacement: The act or process of exchanging one thing or person with another.

Research: To gather new information about a subject.

Resource Node: A Space Station *Freedom* module that serves as a passageway.

Resupply: To bring additional or replacement supplies.

Robot: A machine that performs in a seemingly human way.

Rotate: To turn or spin.

Simulate: To copy or to recreate.

Solar-powered: Power or energy obtained from the Sun.

Space Suit: A special suit designed to protect an astronaut outside of a spacecraft.

Space Walk: An astronaut moving about in space outside of a spacecraft.

Spare: Extra parts.

Suction: An inward flow of air, like a vacuum cleaner.

Telerobotics: Human operation of machines from a distance.

Transport: To move from one place to another.

Treatment: Medicine or directions given by a doctor to a patient.

Truss: A framework of a structure or building.

Universe: All the things that exist.

Vacuum: An empty space that contains nothing.

Vacuum-packed: Placed in an airtight container.

Wardroom: An area used for eating and relaxing.

Waste: Something that cannot be used; garbage or undigested food.

Weightless: Little or no weight because of the lack of gravity.

Weightlessness: The feeling of floating because of the lack of gravity.

Work: To do or make something.

Notes

NASA Teacher Resource Centers

Teachers should contact the appropriate field center below for additional information about NASA educational programs and resources.

Alaska Arizona California Hawaii	Idaho Montana Nevada Oregon	Utah Washington Wyoming	NASA Teacher Resource Center Mail Stop TO-25 **NASA Ames Research Center** Moffett Field, CA 94035 PHONE: (415) 604-3574
Connecticut Delaware District of Col. Maine	Maryland Massachusetts New Hampshire New Jersey	New York Pennsylvania Rhode Island Vermont	NASA Teacher Resource Laboratory Mail Code 130.3 **NASA Goddard Space Flight Center** Greenbelt, MD 20771 PHONE: (301) 286-8570
Colorado Kansas Nebraska	New Mexico North Dakota Oklahoma	South Dakota Texas	NASA Teacher Resource Room Mail Code AP-4 **NASA Johnson Space Center** Houston, TX 77058 PHONE: (713) 483-8696
Florida Georgia	Puerto Rico U.S. Virgin Islands		NASA Educators Resource Laboratory Mail Code ERL **NASA Kennedy Space Center** Kennedy Space Center, FL 32899 PHONE: (407) 876-4090
Kentucky North Carolina	South Carolina Virginia	West Virginia	NASA Teacher Resource Center Mail Stop 146 **NASA Langley Research Center** Hampton, VA 23665-5225 PHONE: (804) 864-3293
Illinois Indiana	Michigan Minnesota	Ohio Wisconsin	NASA Teacher Resource Center Mail Stop 8-1 **NASA Lewis Research Center** 2100 Brookpark Road Cleveland, OH 44135 PHONE: (216) 433-2016 or 2017
Alabama Arkansas	Iowa Louisiana	Missouri Tennessee	NASA Teacher Resource Center **Alabama Space and Rocket Center** Huntsville, AL 35807 PHONE: (205) 544-5812
Mississippi	NASA Teacher Resource Center Building 1200 **NASA John C. Stennis Space Center** Stennis Space Center, MS 39529 PHONE: (601) 688-3338		**Tri-State Learning Center (SSC-TRC)** NASA Teacher Resource Center Rt. 72 West, Box 748 Tishimingo, MS 38852 PHONE: (601) 423-5055
The Jet Propulsion Laboratory (JPL) serves inquiries related to space and planetary exploration and other JPL activities.			NASA Teacher Resource Center JPL Educational Outreach **Jet Propulsion Laboratory** 4800 Oak Grove Drive, Mail Code CS-530 Pasadena, CA 91109 PHONE: (818) 354-6916
Central Operation of Resources for Educators (CORE) provides educators with another source for NASA educational audiovisual materials. CORE will process teacher requests by mail for a nominal fee. Educators can request a catalog and order form on school letterhead.			**NASA CORE** Lorain County Joint Vocational School 15181 Route 58 South Oberlin, Ohio 44074 PHONE: (216) 774-1051 Ext. 293/294

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